Marine Physical Laboratory

(2)

Program in Marine Physics Applied to Navy Undersea Missions

Kenneth M. Watson / Fred H. Fisher
Principal Investigator(s)

Final Report to the
Naval Research Laboratory
Contract N00014-88-K-2040
for the Period 10-01-88 - 09-30-91

MPL-U-70/92
August 1992

Approved for public release; Distribution unlimited.

University of California, San Diego
Scripps Institution of Oceanography

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. Agency Use Only (Leave Blank).	2. Report Date.	3. Report Type and Dates Covered.
	August 1992	final report

4. Title and Subtitle.

Program in Marine Physics Applied to Navy Undersea Missions

5. Funding Numbers.

N00014-88-K-2040

Project No.
Task No.

6. Author(s).

Kenneth M. Watson and Fred H. Fisher

7. Performing Monitoring Agency Names(s) and Address(es).

University of California, San Diego
Marine Physical Laboratory
Scripps Institution of Oceanography
San Diego, California 92152

8. Performing Organization Report Number.

MPL-U-70/92

9. Sponsoring/Monitoring Agency Name(s) and Address(es).

Naval Research Laboratory
Atten: Code 5160
4555 Overlook Avenue, S.W.
Washington, D.C. 20375-5000

10. Sponsoring/Monitoring Agency Report Number.

11. Supplementary Notes.

12a. Distribution/Availability Statement.

Approved for public release; distribution is unlimited.

12b. Distribution Code.

13. Abstract (Maximum 200 words).

The objective of this program has been the development and testing of innovative sensor technology and experimental techniques.

14. Subject Terms.

acoustic arrays, freely drifting VLF sensors, DIFAR sensors

15. Number of Pages.
3

16. Price Code.

17. Security Classification of Report.	18. Security Classification of This Page.	19. Security Classification of Abstract..	20. Limitation of Abstract.
Unclassified	Unclassified	Unclassified	None

Program in Marine Physics Applied to Navy Undersea Missions

Final Report to the
Naval Research Laboratory
Contract N00014-88-K-2040
for the Period 10-01-88 - 09-30-91
Principal Investigators: Kenneth M. Watson/Fred H. Fisher

Introduction

The objective of this program has been the development and testing of innovative sensor technology and experimental techniques. Over the course of this program, the following tasks were carried out:

* Slack Line Arrays
* Real-Time Transmission of Freely Drifting VLF Sensor Data
* Noise Environment for Buried, Bottom-Mounted, and Tethered VLF Sensors
* Vertical DIFAR Array

Task Descriptions

Slack Line Arrays

The objective of this task was to develop an inexpensive complement or alternative to conventional fixed geometry acoustic arrays with self-focussing capability (no active localization of array elements). Realized as an expendable, large-aperture string of sensors, such a slack line array might be a high gain alternative to a conventional sonobuoy or VLAD.

Real-Time Transmission of Freely Drifting VLF Sensor Data

The objective of this task was to develop an acoustic real-time data transmission capability between an array of freely drifting VLF sensors and a surface-coupled relay buoy. Establishing a several kb/s communicative link with the sensors satisfies a desirable system capability of real-time data retrieval while at the same time enable taking advantage of the low self-noise characteristics of freely drifting sensors.

Noise Environment for Buried, Bottom-Mounted, and Tethered VLF Sensors

The objective of this task was to measure the noise environment for various VLF sensor configurations in-situ on the deep seafloor. These measurements help provide information on the optimal placement of sensors from a signal-to-noise stand point.

Vertical DIFAR Array

The objective of this task was to develop a vertical array of DIFAR elements to provide high resolution in the vertical along with at least some resolution in the horizontal. In the context of ambient noise studies, by adding discrimination capabilities to a vertical line array, a single array deployment can provide information on the two-dimensional distribution of ambient noise. In the context of signal propagation studies, the range/depth estimation capabilities of a vertical array combined with the bearing estimation capabilities of DIFAR sensors can provide complete source localization estimation from a single array.

Summary

This program has emphasized the development and testing of innovative ocean acoustic sensor technology and experimental techniques. A detailed discussion of the results from these tasks will not be repeated here. These results are available in the several technical reports, conference papers, and journal articles listed in the reference section, generated under this program.

References

Journals

1. J. A. Hildebrand and W. S. Hodgkiss, "Large-aperture arrays for VLF ambient noise and signal propagation studies," Oceans '90 90CH2858-9, 24-29 (1990).
2. R. Currier, R. Harriss, and C. Nickles, and H. Hodgkiss, "An autonomous seafloor recording capsule," Oceans '91, 1681-1686 (1991).
3. J. C. Nickles, G. L. Edmonds, R. A. Harriss, F. H. Fisher, W. S. Hodgkiss, J. Giles, and G. L. D'Spain, "A vertical array of directional acoustic sensors," Oceans '92 (in press).
4. G. L. D'Spain, W. S. Hodgkiss, G. L. Edmonds, J. C. Nickles, F. H. Fisher, and R. A. Harriss, "Initial analysis of the Data from the vertical DIFAR array," Oceans '92 (in press).
5. L. M. Dorman and A.E. Schreiner, "The depth dependence of seismic background noise within the sea floor," J. Geophys. Res. (submitted).
6. J-M Tran, G. Chen, and W. Hodgkiss, "Random array matched-field processing and array surveying," Oceans '91, 767-770 (submitted).

Scripps Institution of Oceanography Reference Series

1. G.C. Chen, "VLF source localization with a freely drifting acoustic sensor array," SIO Reference 92-18, Scripps Institution of Oceanography, San Diego, CA, (1992) (Ph.D. Dissertation, Scripps Institution of Oceanography, San Diego, CA).

Technical Memorandums

1. G. C. Chen, G. L. D'Spain, W. S. Hodgkiss, and G. L. Edmonds, "Freely drifting Swallow float array: July 1989 trip report," MPL TM-420, Marine Physical Laboratory, Scripps Institution of Oceanography, San Diego, CA (1990).
2. G. L. D'Spain, W. S. Hodgkiss, and G. L. Edmonds, "Trip report - June 1989 Swallow float deployment with RUM," MPL TM-424, Marine Physical Laboratory, Scripps Institution of Oceanography, San Diego, California (1990).
3. G. C. Chen and W. S. Hodgkiss, "Localizing Swallow floats during the July 1989 experiment," MPL TM-421, Marine Physical Laboratory, Scripps Institution of Oceanography, San Diego, CA (1990).
4. A. Dotan, W. S. Hodgkiss, G. L. Edmonds, and J. C. Nickles, "Acoustic modem: 20 December 1989 Trip Report," MPL TM-422, Marine Physical Laboratory, Scripps Institution of Oceanography, San Diego, CA (1990).
5. A. Dotan, W. S. Hodgkiss, G. L. Edmonds, and J. C. Nickles, "Acoustic modem: 16 March 1989 trip report," MPL TM-423, Marine Physical Laboratory, Scripps Institution of Oceanography, San Diego, California (1990).
6. G. L. D'Spain and W. S. Hodgkiss, "Trip report and preliminary analysis of the July 1991 vertical DIFAR array and engineering sea test," MPL TM-430, Marine Physical Laboratory, Scripps Institution of Oceanography, San Diego, CA (1992).

ONR/MPL Report Distribution

Scientific Officer
Naval Research Laboratory (3)
Code 5160
Department of the Navy
4555 Overlook Avenuet
Washington, D.C. 20375-5000

Administrative Grants Officer (1)
Office of Naval Research
Resident Representative N66018
University of California, San Diego
(Mail Code 0234) 8603 La Jolla Shores Drive
San Diego, CA 92093-0234

Director
Naval Research Laboratory
Atten: Code 2627
Washington, D.C. 20375

Defense Technical Information Center (4)
Building 5, Cameron Station
Alexandria, VA 22314